

DEC STD 010-2 Engineering Documentation Checking: Printed Circuit Checklist

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ABSTRACT: This standard provides a guide for the Printed Circuit (PC) checker to use in meeting Digital standard and design requirements.

APPLICABILITY: A guide for all designers who create and check PC layouts and related documentation.

STATUS: APPROVED 10-May-1990; use VTX SMC for current status.

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1 INTRODUCTION

This standard provides guidelines for the individual(s) responsible for checking printed circuit (PC) layouts and related documentation. A clear understanding of all related standards is essential in order to perform a thorough check.

The guide includes such areas as the design package contents and general considerations, as well as more specific areas such as the parts list, UA (Unit Assembly) drawing, and MD (Mechanical Detail) drawing.

The section is a general guide. Each site may have specific variations or modifications of their own.

When appropriate, experimental prototype requirements are listed separately from pre-release requirements. The experimental prototype requirements reflect the minimum requirements for a PC board that will not go into mass production. Pre-release requirements are those for a board that is expected to be released to Manufacturing for mass production.

Certain items are especially important for manufacturability. A producibility checklist has been developed by Producibility and Technical Services. There may be additional or updated items on the producibility checklist that are not included in this standard. To obtain copies of the producibility checklist or to obtain answers to specific producibility questions about a particular PC design, contact the producibility engineer responsible for that design (listed on Pre-Design Producibility Questionnaire).

2 DESIGN PACKAGE CONTENT AND REQUIREMENTS

Additional information on PC documentation can be found in

- *DEC STD 140-0 Documentation, Data, and Release Requirements for Printed-Wiring Boards, Modules, and Backplanes - Introduction*
- *DEC STD 140-1 Documentation Requirements for Printed-Wiring Boards (50-Class)*
- *DEC STD 140-2 Documentation Requirements for 54-Class Modules and Backplanes*
- *DEC STD 140-3 Documentation Requirements for Backplanes (50, 54, and 70-Class)*
- *DEC STD 140-5 Prototype Release Requirements for Printed-Wiring Boards, Modules, and Backplanes*
- *DEC STD 140-6 Production Release Requirements for Printed-Wiring Boards, Modules, and Backplanes*
- *DEC STD 140-7 Engineering-Supervised Build (ESB) Release Requirements for Printed-Wiring Boards and Modules*

2.1 EXPERIMENTAL PROTOTYPE

experimental prototype is a board in the early design and conceptualization stage. It is produced for internal use only. See DEC STD 140-5.

Experimental prototype design packages for checking should contain the following items:

- a. Up-to-date K-PL
- b. MD drawing

- c. UA drawing
- d. Printed Circuit Work Order
- e. Pre-Design Producibility Questionnaire (PDQ)
- f. Post-process data form
- g. For components without Digital part numbers, vendor specifications are required.
- h. Mechanical detail for placement restrictions from engineering
- i. Reproducible C.S.
- j. PDF Tape/Data Base
- k. PDF Checker (VLS)
- l. VSA report (space check)
- m. 1:1 Varian plots (all layers)
- n. Prototype Producibility Feedback Report on any previous revision
- o. CS to PDF comparison (VLS)
- p. Drawing directories (at release only)
- q. Etch cut (EC) drawing, showing etch pattern for all positive layers (should be present even if no etch cuts are required) (at release only)

NOTE

All drawings shall be "formalized" at release time.

2.2 PRE-RELEASE

If it is anticipated that the module will be released for mass production, a pre-release prototype is built in preparation for release. See DEC STD 140-6.

3 GENERAL ARTWORK CONSIDERATIONS

Refer to *DEC STD 030-0 Module Manufacturing Standard* for details.

4 COMPONENT CONSIDERATIONS

Refer to DEC STD 030-0 for details.

5 PARTS LIST (K-PL)

- a. Drawing number and revision number shall agree with the drawing directory for the module.
- b. The format shall follow *DEC STD 025-0 Parts List*.
- c. K-PL shall accurately follow the engineering mark-up.
- d. Parts numbers shall be proper Digital part numbers with descriptions.
- e. Reference designators to component type shall follow *DEC STD 056-0 Circuit Diagrams and Item Designations - General Requirements* and *DEC STD 030-0 Module Manufacturing Standard*.

- f. Part numbers should be sorted/compacted at release.

6 SCHEMATIC

- a. The drawing number and revision of the schematic shall agree with the drawing number and revision in the module drawing directory.
- b. The format shall follow DEC STD 056-0 or *Symbology Handbook* , A-MN-ELEN304-00.
- c. The schematic shall be accurate per engineering mark-up.
- d. Multilead components shall be pinned correctly on schematic.
- e. There shall be no duplication of gate usage.
- f. Power and ground shall be assigned to the appropriate connector fingers.
- g. Proper decoupling shall be shown. If not on sheet 1, there should be a note telling which sheet it does appear on.
- h. Spare ICs and gates must be called out accurately if they are required by the engineer.
- i. Source and required decoupling shall be shown for unusual voltages.

7 COMPARISON OF PARTS LIST AND SCHEMATIC

- a. Component type must agree with reference designator.
- b. Component quantity must agree.
- c. Component values must agree.

8 MD DRAWING

- a. The format shall follow DEC STD 140-1.
- b. "TH" holes (0.157 diameter, unplated with no pad) shall be present and in correct location (refer to DEC STD 030-4).
- c. Cross-section of layers is required if non-standard layup is used. Refer to DEC STD 140-1.
- d. The drawing shall have proper drawing number and revision as per the drawing directory for the module.
- e. Step and repeat codes shall be shown in fabrication notes.
- f. ESB (Engineering-Supervised Build) shall be noted (when applicable).
- g. Show location for Digital logo if not in database.
- h. All drawing numbers/blocks filled in.
- i. Non-standard cutouts dimensioned.
- j. Solder mask/autothieving voids dimensioned (from "H" Master 0), if not included as data in data base.
- k. Add any control drawing set notes (if applicable).
- l. If silkscreen nomenclature is used, layers shall be included.

9 UA DRAWING

- a. Circuit dimensions should be shown in inches and millimeters as a reference.
- b. Test reference designators (TH1-TH4) shall be labeled.
- c. The drawing shall have proper drawing number and revision as per module drawing directory.
- d. The format shall follow DEC STD 140-2 and DEC STD 140-3.
- e. IC sockets shall be shown with reference designators (XE_ _).
- f. Spare and optional components shall be called out in the notes column.
- g. ESB (Engineering-Supervised Build) shall be noted (when applicable).
- h. Pin 1 shall be identified on all ICs and on any device with more than two pins in which orientation is important.
- i. HPWR rating specified in the notes section.
- j. Cross-section of assemblies/item numbers.
- k. Component polarity.
- l. Multiple sheets for assemblies with components on both sides of a PC board and for any rework instructions.

10 COMPARISON OF K-PL AND UA DRAWING

This subhead applies only for non-SUDS input.

- a. Components on UA drawing shall agree physically with parts in the K-PL.
- b. Quantities of components shall agree.

11 CIRCUIT IDENTIFICATION

11.1 SIDE 1

For marking requirements, see DEC STD 030-0.

11.2 SIDE 2

For marking requirements, see DEC STD 030-0.

12 CIRCUIT CONTENT

12.1 ELECTRICAL CIRCUIT CHECK

- a. Inner layer connections shall be checked for:
 - Continuity check (automated/manual)
 - Proper Vcc and ground for any component tied to an inner layer (heat relief where required).
 - Proper connections for other voltages.
 - Proper clearance where no connection required.

- Proper inner layer splits (when used).
- b. Reserved fingers shall not be used.
- c. Vcc nets shall connect to proper fingers, if applicable.
- d. Ground shall connect to proper fingers, if applicable.
- e. Odd voltages shall connect to proper fingers, if applicable.
- f. Spare fingers shall be extended to a via.
- g. Outer layer power and ground etch shall be 0.050 inch minimum width, unless Engineering gives prior approval.
- h. HPWR spacing requirements (HPWR boards).

12.2 SOLDER MASK

- a. Artwork must be checked for proper pad sizes (manual rework, if not in the database, only).
- b. Solder mask rework must be shown on MD drawing (dimensioned), if not in the database.
- c. Any conductor area larger than 0.187 by 0.187 inch (as dictated by the requirements of *DEC STD 030-4 Module Manufacturing Standard - Printed-Wiring Board Design Requirements*) shall be free of solder mask.
- d. "Electrical" rework (test points and so forth) should be uncovered. See DEC STD 030.

APPENDIX A REFERENCED DOCUMENTS

A.1 EL-Class Digital Documents

EL-Class Number	Document Title
EL-00010-00	<i>DEC STD 010-0 Engineering Documentation Checking: General Requirements</i>
EL-00025-00	<i>DEC STD 025-0 Parts Lists</i>
EL-00030-00	<i>DEC STD 030-0 Module Manufacturing Standard - Introduction and General Information</i>
EL-00030-04	<i>DEC STD 030-4 Module Manufacturing Standard - Printed-Wiring Board Design Requirements</i>
EL-00056-00	<i>DEC STD 056-0 Circuit Diagrams and item Designations - General Requirements</i>
EL-00140-00	<i>DEC STD 140-0 Documentation, Data, and Release Requirements for Printed-Wiring Boards, Modules, and Backplanes - Introduction</i>
EL-00140-01	<i>DEC STD 140-1 Documentation Requirements for Printed-Wiring Boards (50-Class)</i>
EL-00140-02	<i>DEC STD 140-2 Documentation Requirements for 54-Class Modules and Backplanes</i>
EL-00140-03	<i>DEC STD 140-3 Documentation Requirements for Backplanes (50, 54, and 70-Class)</i>
EL-00140-05	<i>DEC STD 140-5 Prototype Release Requirements for Printed-Wiring Boards, Modules, and Backplanes</i>
EL-00140-06	<i>DEC STD 140-6 Production Release Requirements for Printed-Wiring Boards, Modules, and Backplanes</i>
EL-00140-07	<i>DEC STD 140-7 Engineering-Supervised Build (ESB) Release Requirements for Printed-Wiring Boards, Modules, and Backplanes</i>
EL-EN304-00	<i>Symbology Handbook</i>

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